BIO-DYNAMICS

A periodical furthering soil conservation and increased fertility in order to improve nutrition and health.

WINTER 1957

Page

THE BIODYNAMIC TREATMENT OF FRUIT TREES, BERRIES AND SHRUBS ..... *Ehrenfried E. Pfeiffer* 2

THE TREE IN THE MEADOW ..... *Elizabeth Ingles* 19

REPORT OF THE 1956 BIO-DYNAMIC FARM CONFERENCE ... 25

BOOK REVIEW 33

THE RELATIONSHIP OF NUTRITION AND THE PSYCHOLOGICAL DEVELOPMENT OF THE CHILD ..... *W. Coda Martin, M. D.* 35

NUMBER 42

Published and Copyright (1957) *by the*

BIO-DYNAMIC FARMING AND GARDENING ASSOCIATION, INC.
R. D. 1, CHESTER, NEW YORK

"Bio-Dynamics" Trade Mark Registered · Price 40c a copy; $1.50 a year

THE BIODYNAMIC TREATMENT OF FRUIT TREES, BERRIES AND SHRUBS

EHRENFRIED E. PFEIFFER

The treatment of fruit trees, berries and shrubs is undertaken with the final aim of producing healthy plants and fruit, while avoiding the use of poisoning sprays. To make it possible to produce the desired results without any insecticides or pesticide sprays depends on many factors, not all under the control of the grower. We will discuss, therefore, some of the basic principles of tree, berry and shrub biology, some of the handicaps the grower will encounter and some practical measures to be undertaken in the two phases of the work: the conversion period and the final goal. The grower needs to have patience and perseverance and should not expect an orchard free of pests right in the first or second year of the conversion phase.

The biology of the tree (and of berries and shrubs, i.e. of all wood-developing plants of perennial character) is entirely different from that of an annual or biennial plant. While the annual seeks its nutrients in the surface layer of the soil, the tree grows its two root systems — one with feeder roots near the surface, the other sending mechanically supporting and feeder roots into the deeper layers or subsoil.

When planting trees or reclaiming older stands, both layers of the soil need attention. The preparation of an orchard begins, therefore, with the selection and pre-treatment of a suitable field.

Preparation of the Soil for Tree Planting.

If the field has never been cultivated, it has a natural structure, the humus gradually becomes less as the depth increases. Natural strata such as hard or clay pan or podsol layers may, however, exist. If the field was previously under cultivation there will also be found all the hardpans and plow soles resulting from this. Now there is nothing a tree dislikes more than a hardpan and wet feet, that is, standing moisture in the root area, which hinders the even development of a spreading root system. Each disturbance of the root system reflects itself in the growth of the tree, of the crown. The results can include abnormal growth pattern, canker, bleeding and gumming, susceptibility to pests.

EDITORIAL BOARD OF BIO-DYNAMICS: ALICE HECKEL, EDITOR; FRED HECKEL, ASSISTANT EDITOR; PETER ESCHER, NEWS EDITOR.
Threefold Farm Spring Valley, N. Y.

The soil should be carefully prepared by deep subsoiling in order to break the hardpan and establish water and air circulation. A plant root absorbs and needs for its health oxygen (air) ; it absorbs oxygen to the total of its own root volume per day. Where drainage is poor, this should be taken care of at once. Any measure to establish a crumbly structure is of advantage. The orchard field should also be well leveled and graded. This facilitates later cultivation, mulching, irrigation.

In the first year of an orchard, subsoiling, plowing, disking and grading is to be done prior to any planting. A nourishing cover crop such as vetch, rye, soya beans, may be grown and disked under after well-rotted manure or compost has been spread. The more humus a soil contains, the better it is for the coming tree. The better the manure or compost has been worked into the soil, the faster the roots will develop. Once the trees are grown up, it is difficult to work into the depths. This has to be done first. Here we see already the handicaps in reclaiming an older orchard — situations may exist with regard to hardpan and generally unfavorable structure, which cannot be overcome. No fertilizer or spray applied later on can overcome the circulatory disturbance of a tree, the root of which is stopped by a hardpan or standing moisture.

On shallow soils and soils with a high ground water level, it makes little sense to select high stemmed or other trees which require a deep-growing root. Here dwarf types are in order.

Using the B.D. method, the disked-in manure and compost will have been treated with the B.D. preparations 502 to 507 or the B. D. Compost Starter. This adds already digested organic matter and humus. Trees don't like raw manure or raw organic matter. In the woods the raw organic matter remains on top, only leaf mold humus is in touch with the roots. The process of humification in woods is slow. The grower has, for practical reasons, to speed it up. The soil is pre-treated when the cultivation begins, with the B.D. Field Spray or the Preparation No. 500, in order to stimulate humus formation and to activate the availability of the minerals and to foster the fixation of nitrogen. Let us assume this has all been done correctly. Then after a year of preparatory treatment, the field is ready for the planting of trees. If these things (or certain ones of them) have not been done correctly, then we have already created that many biological causes for diseases, pests and crop failures.

Suppose that somebody has already planted the seedling trees, then he still has a chance to catch up by thorough interrow cultivation, going as close to the trees as possible without hurting the roots.

An interesting disease phenomenon was observed in Germany some years ago: the sudden dying of fir trees 30 years after the forest was planted. Sub-marginal arable fields which had been cultivated for crops for many years were forested. For a while, everything went well. Then the trees began to die off. The roots, it was found, had grown into the plowsole and other strata which were unfavorably influenced by the previous cultivation.

Even green manuring should be well decomposed when preparing a tree planting bed. This applies likewise for nursery beds. An important question is: should the planting hole be large and deep or narrow? We are inclined to suggest a narrow hole just deep enough to hold the tree and its initial root development. The reason against large holes is: a greater amount of settling, and loose soil, so that the tree tends to shake loose and "rattle" in the hole. Also, in a large hole with looser soil, the tree may grow fast at the start. Then when the roots reach the native soil they will stop, or grow very slowly, causing circulatory disturbances in the rising sap. Cankerous growth, gum bleeding and undernourishment, that is, susceptibility of the twigs and leaves are the consequences. We prefer a rather slow but steady growth in the beginning. The tree needs a firm, well developed root system and then the necessary time for crown growth. Rather have the first crop one year later, but have a healthy tree. In the long run this pays better.

The planting hole is filled with a mixture of the soil and very well rotted, earthy compost — *not* half-rotted or fresh compost and manure. Be sure that the soil is tightly pressed around the tree, so that it does not wobble in the hole. A supporting post may be used for it, but it makes little sense that a tree should grow "on crutches". Espalier is, of course, the exception.

The Planting and Selection of Trees,
Relationship Between Root Stock and Graft.

Not intending to contradict any theory, it seems to us that the best time for planting trees is early Spring. Transplants with a frozen root ball will definitely get a better start than with dried up roots. Since roots should grow right away, we are not much in favor of transplanting in the late Fall for a root which

has settled down for the Winter and will not grow for some time. Then the transplant will be just a stick, and may rattle loose, and roots may break off during the Winter.

Since many old roots, after transplanting, will die off anyhow, it is much better to have the root system well pruned and clipped. If favorable conditions of soil, plus the urge to grow with the warming weather and the lengthening days, are given, roots will develop at once.

Transplantation later in Spring or Summer is possible if the moisture situation can be controlled. September planting may still develop roots. There is no dogma on the subject and we are willing to learn from other experiences. But under all circumstances, the planting should be done under conditions which allow root growth at once. The larger the transplant, that is, the older the tree, the more important this rule is. The transplants should be well heeled in, should they happen to arrive at an inopportune time. Nothing handicaps a quick start of growth more than a dried-up root.

Now we come to the chapter which is most important, and least observed in this country as yet, but which is the reason for much agony on the grower's part later on: the relationship between root stock and graft. One of the extremes here is: a fast growing and strongly pushing root, and a slow growing variety grafted onto it. In this case the root will push a lot of sap upward and congestion in the vessels of the trunk will occur. The fruiting area above the graft may swell up and degenerate. Knots and thickening at every joint may develop and become host to numerous infestations. In peaches and cherries, gum bleeding is frequent. Split bark can be seen.

The other extreme is a slow growing and weakly pushing root underneath a fast growing variety of trunk. Undernourishment, leaf drop and blossom drop, insufficient leaf growth, small fruit, incomplete fruit development, delayed maturing will be the result, and the fruit will not keep well. Do not believe that this series of events can be cured by fertilizer, especially nitrogen. This will only add to the trouble.

The school of horticulture at East Malling, England, has for decades developed a typing of the root stock and grafts with regard to their growth properties and the balance between root stock and tree. This grouping is the so-called "Malling" type, numbered in Roman figures I through XV. When the author talked in this country during the middle of the 1930s about the

"Malling" type, he found a general lack of interest. By now at least a few nurserymen are paying attention to the problem.

The selection of the proper Malling type for a given soil and climate can help one to avoid many troubles later on. In fact it is paramount if one wants to have an orchard with no pests and diseases. No spray or fertilizer can overcome the handicap of an imbalanced relationship between root and tree, that is, a disturbance in the turgor of the rising sap and its carrying vessels. If in a human being the circulation of the main blood vessels and of the capillaries and peripheral vessels is impaired by such diseases as arterio-sclerosis (hardening) or athero-sclerosis (fatty degeneration) or by other vascular diseases and spasms, serious conditions prevail. The tree also has carrying vessels which may be too narrow or too large, or the sap may rise too slowly or too fast, and serious conditions develop. One need only think a bit about the biology and physiology of sap circulation to understand this point. After all it is the sap which carries moisture and nutrients to all parts and organs of the tree, leaves, blossoms and fruit. A leaf or blossom drop always means an insufficient supply of moisture and nutrients. Susceptibility to pests and disease will be the unavoidable consequence of an insufficient and imbalanced nutrient supply. We must repeat: the spray gun and fertilizer bags do not make up for fundamental errors in soil structure and biological imbalance of the root and tree.

It is evident that shallow soils need a shallow-growing, spreading root, while deep soils can take a deep-growing tap root. When the tap root hits an unfavorable horizon, hardpan or acid humus layer, for instance a bog iron layer, it will stop growing. Should it be able to pierce this layer, its growth will be slowed down. A disturbance of the tree results. Therefore it is better to select for shallow soils or such soils as have a very high ground water level only shallow-growing root stocks and dwarf trees. For deep soils one may use tall tree varieties with high trunks, i.e., long-bearing trees which grow 30, 40 and 50 or more years. These are the kinds we have inherited from our fathers and grandfathers. The modern economy tends toward a fast turnover and prefers dwarf varieties. These bear earlier, are easier to harvest and to treat. But it should not be forgotten that their life cycle is short, perhaps 15 to 25 years. No spray or fertilizer will make them live longer than their life cycle allows.

High stemmed trees begin to bear later but live longer. If the owner of the orchard is a young man, or a father is planting an orchard for his son, then he may embark on a high stem and long range program. In all other cases we can only advise turning to dwarf trees or medium sized ones. Otherwise the orchardist will never see the fruits of his efforts.

Another problem with regard to root stocks is frequently overlooked: the adaptability to the climate. Southern root stocks grow faster but are not hardened. Because they grow faster, many who want to see quick results fall for them in Northern climates. These colder climates need hardy roots. It is much better, from the biological point of view, to use Northern-grown stocks and take them to a warmer climate. This also will speed growth, but at the same time one has hardiness. It is also better to transplant from poorer to a richer soil or from the mountain to the valley than to do the opposite.

Under all circumstances, when buying seedling trees inform yourself about the proper Malling type.

It is better to transplant yearlings. These will blend better and develop stronger roots in the new environment than 3 to 5-year-old trees. The latter may have been cut back by a nurseryman to look like a younger tree, the stem may look bigger than other trees of that age — but they will adjust themselves with much more difficulty. The apparent gain in size is not actually a gain in terms of earlier cropping.

Another difficulty in transplanting older trees — this applies especially if full-grown trees have to be moved — is encountered by the fact that the inner structure and biochemistry of a tree is organized according to its orientation with regard to north-west-south-east. Branches that have grown towards the southeast contain different structures and a different chemical arrangement (for instance as regards protein) than branches and leaves that grow towards the north or west. When such a tree is transplanted with disregard of its orientation, it will take several years until the tree has re-oriented itself. During this period of readjustment the tree is exposed to growth disturbances, is susceptible to all kinds of attacks, and — in unfavorable soil and weather conditions — will in the end never recover entirely. With yearling transplants one does not have this trouble.

Finally we would like to mention the fact that north or south exposure on a hill or mountain slope also has a bearing on

development. Trees on the north slope develop a firmer, even wood structure, but grow much more slowly, and the maturing of the fruit is slower too. The ideal exposure is southeast. Reflected light — as many observations have shown — has a greater biological activity. This is the reason why fruit grown on the north shore of a lake or river matures faster and is tastier than the same variety growing on the south side. Not everybody, of course, has a free choice in this matter.

Orchards should not be "walled in" in a damp hole. Standing air moisture favors the development of aphis and of fungus diseases. The wind should strike with reasonable freedom through an orchard. The stand should not be completely sheltered, although wind protection against the main influx is suggested.

When transplanting, we found it a good practice to dip the root, just before setting it into the new planting hole, in a rather fluid paste made from clay (80%) and cow manure (20%), so that the root is just covered. To this paste can be added the Biodynamic Preparation No. 500, which stimulates root growth. The planting hole can be lined with very well rotted earthy compost, mixed with the native soil and also sprayed with the Preparation No. 500. The soil should be well firmed in around the root. If the young tree gets a supporting pole, it is wise to tie it to the pole with a rubber band cut, for instance, from an old tire tube, in such a way that the tree is not "hung". It will in all likelihood settle somewhat. Rubbing against the pole should under all circumstances be avoided. One makes a figure eight loop with the rubber band and places the tree in one loop and the pole into the other. The loop around the tree should be higher than the pole loop so that there is a certain "give" to allow for settling.

One frequently observed error is that the soil surface in the hole, close to the trunk, is lower than the general ground level. This causes water to collect, and rotting of the bark and root may be the consequence. Another frequent error is that the grafting scar is buried in the soil, that is, the tree is planted or has settled too deep. The difference between root bark and trunk bark should be understood. The trunk bark, which starts normally just below the grafting scar (about 1 to 2 inches), needs air and will peel off when covered by soil, exposing the wood and causing damage to the cambium. The proper setting of the transplant is a must. In case of need one can always

add some earth to cover exposed root bark, but too deep a setting (in a hole) cannot be corrected by filling up with earth because then the trunk bark will be covered.

Pruning.

No detailed advice for pruning can be given here. A few principal considerations, however, should be borne in mind. The pruning of the young tree shapes it for a lifetime. It should be done correctly during the first two or three years, but little in the way of corrective measures is needed afterwards. The idea of this pruning is to stimulate growth, to form a balance between vegetative growth (shoots) and fruit growth, to allow the light to enter to all parts of the branches. Branches should not grow criss-cross and shade each other. The pyramid-shaped pattern which opens upward and outward definitely has its advantages. Cross-growing twigs and branches should be removed.

New growth of one season is to be cut to about 7 buds from the base of the growth. It is most important that the last, outermost bud is underneath the shoot and not sideways or on top, lest the new branch grow sidewards into other branches, or upward into the crown, taking away light from other branches.

So-called water shoots or suckers coming out from the root must be removed; otherwise they will drain away much needed sap pressure. Vertical water shoots in the crown always indicate that the tree has not been properly pruned and that there is no balance between vegetative and food growth nor in sap pressure (turgor) between the root and crown. An undernourished tree also will grow water shoots in order to increase the foliage surface area. At the same time, the foliage of these shoots will take away light from the rest of the crown. The best advice we ever have heard came from a very experienced and successful orchardist: "Let the tree tell you how it wants to grow and what it needs; always consider the balance, and that need for light". Whoever does not understand this should not attempt to prune. Sometimes we even find commercial "tree surgeons" who do not know of the growth pattern of the tree. These are tree butchers rather than "surgeons".

Old trees may be rejuvenated by a severe cutting back. This is successful when done with understanding. If, the year thereafter, lots of suckers develop, you know that it was not properly done. Old, dead wood should be removed at once, lest the wind may break off the branches and carry some good ones away too. Apples and pears are usually pruned towards the end of the

winter, when frost can do no more serious damage, but definitely before the sap begins to rise. Peaches do well also with June pruning. This, however, is a matter of experience.

In any case, the pruning shears or knife should be sharp to avoid squeezing. There should be a clean cut face and no bark should be squeezed or torn. The cut should be as close as possible to the bud or eye, then it will heal best. "Stumps" will only die off and lead to bark peeling and dead wood which offers a welcome nesting place for pests. The cut should be as close as possible to the vertical plane. Horizontal cuts will only show a "face" exposed to the weather and lead also to bark peeling and injury. Never forget that any injury to the bark will expose the cambium and cause a serious disturbance.

Tree Care.

Under this heading we include all measures, in addition to fertilization, which make possible a strong, vigorous growth and a healthy, resistant tree. Only if the proper tree care is given, can one then decide what the tree needs with regard to fertilizer and sprays. Tree care is that item which is most neglected due to the erroneous concept that fertilizer and poisonous sprays can cure all ills. Under this heading there comes also, with the Biodynamic Method, a specific suggestion made by the founder of the method, the late Rudolf Steiner. Wherever this program of tree care has been properly applied and followed through, it has been found that healthy trees were the result, and few, if any, corrective sprays were needed. Tree care is simple but — it is something that just has to be done. The time and labor spent on it are well-returned in improved crops and reduced needs for poisoning sprays.

This tree care needs to be carried out only once a year, if everything goes well it can even be only every other year. It consists of the following steps:

1. Remove all dead wood at any suitable time.
2. Pruning, and cutting of suckers.
3. Removing all dead and loose bark, moss, lichen, by brushing with a soft wire brush. In this way you remove a lot of insect pests and their hiding places. This should not be done during the growing period when the sap is rising.
4. If the tree is otherwise healthy, washing off, or spraying, with the solution of Preparation No. 500 and equisetum tea is sufficient. It is best done in Fall after harvest or in Spring, after pruning, and when the buds are open.

5. As a general measure for all trees which need improvement and strengthening, and as a protective measure against insect pests and disease, the Biodynamic Tree Paste is applied. This is best done in Fall right after the leaves have dropped, or in Spring before the emergence of the buds.

6. Any sprays of non-toxic, organic materials, at the time needed and as often as seems necessary. It has been found, however, that the correct and thorough application of the tree paste (5.) will reduce considerably, or even eliminate, the need for sprays.

7. Biological control by way of bird protection, placing of nesting houses for birds, and introduction of predatory insects.

8. Biodynamic Spray No. 501: applied only into the green foliage, May through July.

Ad. 4. Tree Washing with No. 500 and equisetum tea.

One portion, or unit, of No. 500 is suspended in 2 to 4 gallons of plain water or rain water. If chlorinated city water has to be used, let it stand for a few hours in a pan or bucket exposed to the daylight, if possible to sunlight. To this add a tea made from horsetail-equisetum arvense. Theoretically a total solution consisting of 2% of the tea would be best. There is, however, not enough equisetum arvense available. We have, therefore, made a compromise and suggest the use of an 0.5% solution. This means that the final wash or spray solution should have a (tea) strength of 0.5%.

For each gallon of spray solution, ⅔ of one ounce of the dry herb has first to be measured out. Thus we would have:
for 1 gallon, ⅔ of one ounce; for 2 gallons 1 and ⅓ ounce;
for 3 gallons, 2 ounces ; for 4 gallons, 2 and ⅔ ounces.

The required amount of the tea is just covered with water and brought to a boil, then allowed to simmer for 15 to 20 minutes (finely powdered or shredded equisetum arvense for a shorter time, coarse material for a longer time) to make a tea concentrate. The concentrate is then mixed with the suspension of the Preparation No. 500 in water, and well stirred for about 10 minutes. Then it is so sprayed into the tree that the solution covers the entire trunk and branches. This very same spray is used as a foliage spray to reduce fungus development, especially during a wet season (damping off, or mildew, for instance). Equisetum arvense contains a protective factor against fungus infection. The Preparation No. 500 stimulates the growth and renewal of the cambium — as well as doing this for the root when sprayed on the soil.

This washing of the tree is recommended in all cases where the tree has a lot of loose, peeling bark, split bark, bleeding, lesions from pruning or breaking off branches, and especially recommended if the tree is covered with mold, mildew, lichen, moss. In the latter case it is a preparatory step to the application of the tree paste.

Ad. 5. The B. D. Tree Paste Application.

This has been, in our experience, a most effective means of getting healthy trees with a smooth bark, healing lesions, and protecting the tree as much as possible against pests, especially those which hibernate underneath the bark, or in crevices — sucking insects, scale, aphis, wooly aphis, etc. That is, provided that the job is done right. The principle is that the *entire* tree, trunk, branches, twigs, buds, is thoroughly covered with the paste. Many of our biodynamic orchardists have covered only the trunk. This restores a healthy trunk. Yet many pests hibernate and lay their eggs on the outer twigs and near the buds — for instance bud borer, aphis, scale — and are in this case not counteracted by the paste. It is especially important that not only the under side of the branches is covered, but the *entire* branch, including the dead corners where the branching off takes place, and that no loose bark remains to give hiding places.

Any lesion of the timber can be painted with the paste, which is a much better procedure than covering with tar, oil, asphalt, or paint, as is usually done. Holes in the trunk should be well cleaned out and then filled with the paste. If eggs, larvae, scale, are covered with the paste, it will exclude the air from them and they will perish. Since this paste is entirely harmless, and in no way toxic, it is an ideal means of protecting the tree and avoiding poisoning sprays. We have even sprayed it on the green foliage, when this was attacked by pests and fungi (rust for instance, or mildew), so that the leaves were entirely "painted yellow". The rain washes it off eventually, and leaves recover with a healthy green.

The original recipe for the tree paste was: ⅓ sticky clay, ⅓ cow manure, ⅓ fine sand. This mixture is approximate, for the sticking quality varies and the proportions have to be somewhat altered accordingly. As much water is added as is needed so that the paste can be easily applied and still will stick to the tree. To the solution can be added the Preparation No. 500, the equise-

tum tea (if needed), an extract of nasturtium plants against aphis, or other ingredients that one wants to apply. For many years it was the biodynamic practice to apply the paste, in solution form, with a whitewash brush, by hand, to the trunk and larger branches. Nowadays one finds few orchardists who want to paint a tree by hand with a whitewash brush, and we admit it is a rather messy procedure. But everybody is eager to use a pressure sprayer or spray rig. For a few individual trees, the hand application may still be the easiest. For a large orchard spraying is the only way to do it.

Since it has been discovered that many pests lay eggs and hibernate on the finer, outer twigs and buds and have thus never been hit by the paste applied to the trunk, it must now become B. D. practice that the material (in sprayable form) covers the entire tree and even the buds. This applies whether the material is used in Fall (after the leaves have fallen off), or in Spring as a pre-emergence spray (before the buds open, but after the main frost period is over). In the latitude of Philadelphia, for instance, the Spring application will be at the end of February or early in March, further North more toward the end of March.

For application with a whitewash brush, the clay and manure can be fairly coarse, i.e., somewhat granular. For use with spray equipment, the source materials need to be well screened in order not to plug the hose, pump and nozzle. Clay is rather abrasive to pumps; apparently the piston pumps will do better with it than rotary pumps. Spraying equipment such as is used for Bordeaux-lime mixtures will be the best.

The holes of the screen through which the source materials are passed before using should be of the same size as the nozzle to be used for spraying, or just a little smaller than this. Use about 40 to 60 pounds pressure. It is obvious that the manure and clay should be collected and prepared far ahead of time.* This can be done during the dead season. Sand cannot be used in a pressure spraying system. The formula therefore needs some adjustment. Our trials were with 80% clay and 20% manure, well ground and screened so that it does not contain any fibrous material which clogs the nozzle. In some cases we just use, as a nozzle, a half inch galvanized pipe, plugged at one end and with a small slit cut into it with a hacksaw. While this is rather successful and does not clog up, it may waste a lot of

* At the time of this writing (Nov. 1956) experiments are under way in preparation for producing a commercial tree paste mixture with prepared, milled and washed clay and manure, which passes most nozzles. This mixture will be available in 1957, with instructions as to what kind of equipment can be used.

material, and the spraying process is messy. The degree of dilution of the paste-spray, and the timing of the spraying, have to be worked out by more trials. It is absolutely necessary that the entire tree, up into the finest twigs, is covered with a paste, and no uncovered span is left. Only then will the full protection be effective.

As said previously, the same spray can be applied as a foliage spray on green leaves. In practice one will apply the foliage spray as a somewhat diluted solution for which any pressure sprayer will do. It is not necessary to spray this as a mist, but it should go out as fine droplets. The foliage spray can be applied several times a season, as the need arises. But under no circumstances should any spray be applied during blossoming time.

Ad. 6. Organic Sprays With No Lasting Residual Effects.

In heavily infected orchards, during the conversion phase, and when the danger of influx from badly infected neighborhoods exists, one may for the time being need supplementary sprays, until the biodynamic measures in general, and the tree paste, have taken hold of the situation. There is a fundamental difference between non-toxic plant extractions such as equisetum arvense (horsetail), nasturtium, herb teas or suspensions made from stinging nettle, valerian or other plant materials, (which are used as a supplementary biocatalytical or biological spray) on the one hand, and toxic organic sprays on the other. The latter, also from the plant realm, include such materials as derris, rotenone, pyrethrum, rhyania and, to a certain extent, sprays from tobacco (nicotiana). The first group are used as strictly biological and dynamic measures — more or less "remedies".

The sprays of the second group can be tolerated, and even recommended, especially during the initial and conversion phases, in order to get the situation under control. The materials comprising this second group are toxic to insects and, in lesser degree, to man — that is, if they are swallowed directly. They do not last any great length of time after application, and do not produce any lasting residues such as is done by the chlorinated hydrocarbons, DDT, Lindane, Chlordane, Parathion, or the phosphorylated or fluorinated chemical sprays.

These organic non-lasting plant poisons are of particular interest, for insects don't seem to build up immunities to them, as they do with DDT and related products. In fact, they decompose after a few days or weeks. In general, such organic

plant poison sprays can be applied up to 4 weeks before harvest. One exception is rhyania (a commercial product made from it is Rhyanicide — S. H. Penick & Co., 80 Church St., N. Y. C.), which can be applied up to one week before harvest. Rhyania, the shredded and powdered wood of a tropical shrub which grows in Trinidad, is specific against codling moth, corn borer, ear worm, and has proven to be very helpful against many other insects. This is so much the case that we are considering its addition even to the tree paste and foliage spray as a routine practice. Rules for application are given by the manufacturer and need not be repeated here. All these sprays should be mixed with a solvent to remove the waxy or protective layer on the skins of the pests, so that they can penetrate. They also need a glue or gummy substance, so that they stick. Soap solution, especially the liquid (potassium) green soap, is recommended.

Years ago we made tests with earthworms and found that the earthworm population is not harmed or reduced by the application of these organic plant poisons, for they decompose in the soil. Of course, a direct hit on a worm will kill it. DDT, on the contrary, has still been found in the soil in toxic amounts 7 years after application. Even the manufacturing industry is becoming aware of the situation and is searching for non-lasting economic poisons. Recently we read, in the "Medical News", Vol. 2, No. 21, 1956:

"When 2 organic phosphate insecticides — malathion and EPN — are used together, there is a synergistic effect, just as there is in the case of some combination drugs. Together the two chemicals appear to be far more toxic than when they are used singly."

In No. 18 of the same publication there had appeared the following interesting news item:

"Among other foods confiscated by the Food and Drug Administration: ice cream containing boric acid . . . and frozen spinach with excessive DDT residues".

The Journal of Commerce, of August 19, 1955, quoted the Committee on Pesticides of the American Medical Association as stating that Chlordane should not be used on food crops with exposed edible parts or on crops fed to animals, because the chemical can be retained in the food and in milk, eggs and meat.

In 1950 more than 200 million pounds of insecticides were already being used in agriculture, and in the same year the

Federal Food and Drug Administration announced: "The finding of hepatic cell alteration at dietary levels as low as 6 p.p.m. of DDT and the considerable storage of the chemical at levels that might well occur in some human diets, makes it extremely likely that the potential hazard of DDT has been underestimated."

In 1951 the U. S. Public Health Service pointed out that "DDT is a delayed action poison. Due to the fact that it accumulates in the body tissues, especially in females, the repeated inhalation or ingestion of DDT constitutes a distinct health hazard. The deleterious effects are manifested principally in the liver, spleen, kidneys and spinal cord. DDT is excreted in the milk of cows and of nursing mothers after exposure to DDT sprays and after consuming food contaminated with this poison. Children, and infants especially, are much more susceptible to poisoning than adults."

Ad. 7. Biological Control

The foregoing quotation more than illustrates the need for biological control. It is apparent that for health reasons and because of the fast developing immunity of insects to toxic sprays (with the exception of the plant poisons) every attempt should be made to avoid lasting economic poisons. The first step toward achieving this goal is to establish a properly balanced humus soil. Then follows the establishment of a proper biological and growth balance in the fruit tree itself. The third step is the application of non-toxic measures and tree care, as already outlined. The fourth step would be biological control itself, taken by encouraging the natural enemies of the insect pests. The most successful means is bird protection. A pair of titmice, with their young, eat 800 caterpillars a day. A cuckoo eats his own weight of insects daily. There are predatory insects like the praying mantis, wasps which lay their eggs in caterpillars and larvae, and the lady beetle whose help in destroying aphis is unsurpassable — these being only a few among the many other helpers in nature. It is obvious that encouraging all these means that we need to stop spraying any poison which would interfere with their existence. Therefore — see above — we provide for an initial conversion phase where harmless sprays are permitted.

During the initial phase of the biological control, the orchardist may have to take a year of heavy beating, namely during the time he stops spraying poison and the biological control

is not yet 100% effective. This has to be taken in stride and should not discourage the grower. Once the biological control is established, there should be no more difficulty. It should however be borne in mind that the biological control does not take the place of the use of the *tree paste* described previously. The paste is needed for its beneficial influence upon the health of the tree, its cambium, its sap circulation and therefore its proper nutrition.

It has been figured out that 15 to 20 pairs of titmice will completely control that many acres of orchard. It is necessary to have nesting houses to encourage the birds to breed and settle in the orchard. These houses should have one inch holes, so that larger birds (sparrows, for instance) cannot enter and throw out the host or steal eggs. Wren houses need even smaller holes, but the wrens will usually settle in tree holes. Needless to say, bird-catching cats do not fit into this schedule. The bird house should be cleaned during the winter and may need disinfection (lice). Birds are always attracted when a bird bath (shallow pan) is put up for them. They need water, which should also be provided for in the wintertime, even when it freezes. If they are fed during the winter, they will prefer the place where water is also offered. And do not wait to start feeding when the frost and snow have covered the countryside, but start earlier, right at the beginning. Birds will tell each other "This is a good place", and stay. Otherwise a sudden, severe winter, or early snowfall, may weaken them too much to look for your place. In other words, you have to attract them before it is too late. Some suet sticks hung up here and there are very much liked. There is enough literature about bird protection, so we need not go into more detail.

Lady bugs can be bought, but mostly they will be abundant once the biological balance has been established.

One non-toxic way to control pests is also to hang up traps for moths and other insects such as Japanese beetles. These traps are easily made from fruit jars covered with a quarter inch screen in order to shield off bees, etc. These traps are hung into the branches of the trees, and it is advisable to have them in place already at blossoming time. The bottom of a jar is filled, about 1 to 2 inches deep, with a brown sugar or molasses solution. The solution needs to be "spiced" with an attractive aroma. For codling moths a few drops of oil of sassafras has been recommended. For other insects, the proper spice has still

to be found. If you discover any such attracting aroma, please let us know. In these traps, aside from the moths, wasps (of the destructive kind) and Japanese beetles have been found, but only rarely a bee or a lady bug. Beehives near an orchard are, of course, an essential for pollination.

Ad 8. The Biodynamic Preparation No. 501.

This preparation consists of a specially prepared, finely powdered quartz. Not much of it is needed, only a few grams per acre. These are suspended in 2-4 gallons of water (per acre) and sprayed with a fine mist-like spray into the foliage in May and June, but not as long as there is any frost danger. It has to be sprayed into the green foliage and will stimulate the growth and assimilation processes of the green leaves. To stimulate the assimilation means, of course, stimulation of the photosynthesis, and therefore more organic nutrients for the tree, more sugar, carbohydrates and more protein.

This spray is essential when, for any reason, the tree does not develop enough foliage, or has lost its leaves by the attack of pests, fungus disease or for whatever reason. A tree which has lost its foliage because of a borer, Japanese beetle, or blight, can recover when No. 501 is given in June. In June (up to about St. John's Day), the tree has the ability to open up new buds. Once the days get shorter, this is no longer possible. Preparation No. 501 can be sprayed, if necessary, at fortnightly intervals from the end of May to July in the northern latitudes, in the South one could probably begin in March.

To be concluded.

DUES INCREASED AFTER 19 YEARS

At a recent meeting of the Board of Directors of the Bio-Dynamic Farming and Gardening Association, Inc., it was decided to increase the annual membership dues from $3.00 to $4.50. When it is realized that the old dues had remained unchanged since 1938, this necessary step would hardly seem to require explanation. Nevertheless, it was taken with regret, for many, if not most of us who compose the membership of the Association are people of limited means for whom all increased expenditures are a serious matter. One thing might be noted in this connection: Association dues, as well as contributions, are deductible from one's Income Tax.

F. H.

THE TREE IN THE MEADOW *

A fallen tree changes life
in a Sierran meadow

ELIZABETH INGLES

Bio-Dynamics has endeavored to present various aspects of ecology. In fact, the practical application of its principles to farm and garden might well be described as a cornerstone of the B. D. Method. When the editors came across the following delightful article in a recent number of AUDUBON MAGAZINE, they felt that this factual, un-sentimental yet loving report of an example of Nature's ecology was something that should be passed along to our readers. Through the graciously extended permission of John K. Terres, Editor of AUDUBON MAGAZINE, and Mrs. Ingles, the author, this becomes possible. We only regret that a limited budget makes it impossible to re-publish the excellent photographs taken by her husband, Lloyd Ingles, which add so much to the story in its original appearance.

In writing Mrs. Ingles, we asked her if she would also be willing to give us some biographical material about herself. She obliged, as follows:

"I am a native Californian but have traveled extensively throughout North America and Central America. I am a graduate of Chico State College with an A.B. in biology and an M.A. in biology from Fresno State College. I have taught biology at Chico State, several senior high schools and at present am a biology teacher and junior girls counselor at Fresno High. For two years my husband, who is a professor of biology at Fresno State College, was the director of the Audubon Camp of California. During this time I acted as dietitian. I have been interested in natural history ever since I can remember, since I was reared on a farm and had ample opportunity to observe wildlife. My interest in writing stems from college when I was editor of the college paper. I try to find time to write several articles a year for such natural history magazines as Nature, Audubon Magazine, Canadian Nature and for several of the religious publications. We have a young son, ten years old, who wants either a microscope or a chemistry set for Christmas, so I hope we are rearing a budding scientist."

* * *

* *Reprinted from AUDUBON MAGAZINE, November-December 1956 issue, published by the National Audubon Society, 1130 Fifth Avenue, New York 28, N. Y.*

TO THE READER

The little Sierran meadow of this article is one of those "gems" of which John Muir wrote. It is small, only about an acre, and it lies close to the cabin where I have spent a part of every summer for the last ten years. All of the animals mentioned in the article I have seen in the meadow and the incidents recorded have been observed either by me or by my husband, Lloyd Ingles. The pine squirrels, the gophers, the owl, the pileolated warblers, the chipmunk, and the golden-mantled ground squirrel live regularly in the meadow or in the Canadian type forest at its edge. Ten years ago shrews were rare in the meadow, but since the tree fell, as recounted in this article, they have become common. Some of the animals — like the coyote and the weasel, for example — are less frequent visitors to the meadow, but like the owl and the sharp-shinned hawk, they play a very important role in making this spot an interesting and dynamic animal community.

The article was written to show the changes which even the cutting of a single tree, or, in this case, the natural falling of the white fir, can make in an animal community. Here, because the meadow is small, the ecological impact of the falling tree was greater than it would have been in a larger area. But even in a large meadow, incidents which seem insignificant to an observer, as the falling of a tree, bring about modifications which accumulate over a period of time and result in changes in the plant and animal life. —THE AUTHOR

* * *

The day began like any other day. Just as the first glow of dawn tinted the eastern sky, the horned owl sent its last muffled message to its mate in the Jeffrey pine up the ridge. Lazily it closed its round, yellow eyes, and settled down to its daytime sleep on its perch close to the trunk of a tall red fir. Soon the first rays of the sun slanted through the pines and firs surrounding the lovely little Sierran meadow. It was the beginning of a July day which was to alter the lives of many of the creatures that lived there.

A pair of pileolated warblers flashed through the willow thicket in the middle of the meadow. They were garnering insects to feed the five hungry young ones in the nest among the tall grasses at the base of the young lodgepole pine. From a hidden perch, the coldly calculating gaze of a sharp-shinned hawk followed their erratic flight. Not far away, on the ground, a long-

tailed weasel paused to test the air as it jumped through the sedges, the shooting stars, and the tall meadow grass. It was in search of its breakfast.

From the branch of a Jeffrey pine a Steller's jay squawked loudly at a bright-eyed little pine squirrel that mischievously darted at it from around the trunk. A white-footed mouse scampered nervously into its hole in the duff at the base of a red fir, and a dusky shrew hungrily gulped the fat worm it had surprised in the mud at the edge of the tiny brook. A short-tailed meadow mouse hurried along its trail in the thick grass; a montane pocket gopher poked its head cautiously out of its hole in search of a succulent plant. Nearby a golden-mantled ground squirrel and a lodgepole chipmunk chased each other in a dispute over a pine nut.

The rollicking *"dee-dee-dee"* of the mountain chickadee and the insect-like "tick" notes of the Sierra juncos were not unusual sounds in this Sierran meadow. Nor was the sight of the golden flash of the western tanager in flight above the willows, or the throaty songs of the robin unusual here. The distant "yank-yank" call of the red-breasted nuthatch was also a commonplace.

Then — *the tree fell in the meadow.*

As the slanting rays of the morning sun touched the forest on the west side of the meadow, the long shadow of an aged white fir fell on the ground. The shadow was shorter than it had been on the previous day. Only a gentle breeze stirred the branches of the neighboring trees, but the branches of the white fir creaked and groaned as though they were shaken by some mighty force. The fir itself was in motion. The creaking and groaning noises came from its branches as they dragged slowly through those of its neighbors. The meadow suddenly was quiet. Even the noisy jays and pine squirrels were still. The only sounds were those made by the dying tree as it moved slowly but steadily toward the ground. Suddenly the pull of gravity became so strong that the fir fell with a great rush. As it struck the ground, a loud crash reverberated across the shooting stars, the tiger lilies, the sedges, and the meadow grasses.

The tree had cut a great swath through the willow patch, and had scattered rubble from its broken top and branches to the eastern edge of the meadow itself. The stately white fir, which had lived for nearly 400 years at the edge of the meadow, was down. Its mud-encrusted roots, still quivering from the shock of the fall, and the gaping hole it left in the earth, dis-

closed the reason for its destruction, and the shattering of the meadow. As the tree grew, its roots had spread, finally breaking through the wall of an underground spring. The water seeped gradually around the roots of the great tree encroaching more and more until at last the fir, with its "feet" in the water, lacked the support necessary to bear its tremendous weight. The end had come, not only to the dying giant sprawled across the meadow, but also to the community around it, as that community *had* been. From this moment on, the meadow became a changed place.

The pair of pileolated warblers escaped the first great danger when the tree fell. Now the cries of their ever-hungry young grew more demanding. Hastily, they searched over every willow leaf. But where only a short while before willow trees grew, they now found a great open space. The pair hesitated an instant then flew across the new opening toward the willows on the other side. From its hidden perch, the bright eyes of the sharp-shinned hawk saw the motion below. In an instant, in swift erratic flight, it overtook the brightly-colored male warbler, and sank its talons into its flesh. Then it returned to its perch to eat its meal undisturbed. The other frightened warbler sought safety beneath a willow leaf, but later, in an attempt to recross the open space to its nest, fell prey, like her mate had, to the vigilant sharp-shinned hawk. The weasel, attracted by the cries of the starving young warblers, tested the air, then gracefully looped through tall meadow grass, straight to the cup-shaped nest at the base of the lodgepole pine. Then, with its hunger appeased, the sleek creature settled down for a nap in a safe spot beside a branch of the fallen fir. Here the pine squirrel, or chickaree, trying out this new "bridge" over what had been a sea of grasses and willows, nearly stumbled over the weasel. With much chattering and excited screaming the squirrel ran along the trunk of the fallen tree. Soon it was exploring among the firs and lodgepoles at the other side of the meadow.

Hungry now, the chickaree descended from the pine tree where it had been resting on a limb. It crossed the ground to a hole at the base of a stump, and scented a cache of the previous year's pine cones. As it prepared to break into the pile of hidden cones, a pine squirrel raced toward it from a nearby tree, ready to defend its property. Furiously, it chased the invading pine squirrel around and around trees, and then hotly pursued

it along the trunk of the fallen fir tree back across the meadow to the invader's own forest on the other side.

The weasel was awakened from its nap by the noisy cries of the squirrel. Lazily, it stretched its beautiful body. Then keeping close in the shadow of the fallen fir, it renewed its hunt along the ground for food to take to its hungry young in their nest beneath the roots of a nearby conifer. A short-tailed meadow mouse, a busy little daytime traveler, came running along its grass-covered trail. Suddenly it found its way blocked by the fallen tree. Perplexed for an instant, it hesitated. At that moment the weasel came bounding along in the shadow of the fallen giant. The weasel caught the mouse, and with it in its mouth, left the fallen tree and hurried to its nest.

Evening was now settling over the forest. As the sun went down and dusk came on long shadows, a newcomer entered the meadow. Creeping beneath the topmost branches of the fallen fir, a coyote, with its head thrust forward alertly, paused to rest an instant. As it watched, a tall grass in front of it began to tremble and move downward into the earth. The large animal waited, motionless. Soon another grass followed after the first. Then the curious whiskered face of a montane pocket gopher, with its tiny near-sighted eyes, came out of the hole into which the grasses had disappeared. The coyote charged but the gopher darted back into its burrow. Swiftly, the coyote began to dig in the soft earth, but the gopher, safe in its many-branching underground tunnels, was in no great danger. At last, the coyote tired from its fruitless digging, loped wearily from the meadow, while the jays and the pine squirrels screamed defiantly. The saucy jays followed the coyote, traveling above it from pine to pine. Their raucous voices warned all forest creatures that danger was on the prowl. But the porcupine, noisily dragging its quills along the trunk of the fallen giant, paid no heed, for it was unafraid.

When the tree fell, it brought the end of life to a few creatures, but to others it became the symbol of a new era of plenty. As the months passed, the tree became the home of many insects. A termite queen hunting for a place to establish a new colony, found the decaying wood ideal for her needs. She settled down to live her life span under the bark. Her colony grew and prospered, and chewed their caverns and tunnels in toward the heart of the great tree. And at dusk, just as the winged members of the termite colony took flight, to establish new colonies else-

where, the long-eared *Myotis*, common bats of the Sierras, left their daytime perch in a tunnel close by to feed on the insects. As the bats swept the flying termites out of the air, the earth-bound, wingless termites fell easy prey to the voracious appetite of a dusky shrew that lived in the fallen fir. Small beetles, ants, and other insects, and spiders and earthworms became so numerous under the great tree that life became simpler for the ever-hungry shrew. With an endless food supply at hand, this little animal prospered and raised brood after brood. Before the tree had fallen, dusky shrews were not common in the meadow, but as the seasons passed, and the tree sank deeper and deeper into the soft meadow earth, shrews became more and more abundant.

Beside the tree, the grass grew taller and the willows bent over the trunk. Here in this shelter, a mule deer doe hid her fawn while she browsed near. The gaping hole from which the tree wrenched its roots as it fell dried, and earth tumbled into the opening. Above the opening, the great roots stretched out like the arms of a giant octopus. Here one spring a Townsend's solitaire, a newcomer to this Sierran meadow, built her nest in the earth which still clung tenaciously to the sprawling roots. With an ample insect supply close by in the rotting log, the bird had no difficulty in raising its five young. Early each morning, and again as dusk fell, the wonderful melodious song of this bird filled the meadow.

Although the first pair of pileolated warblers were not able to cope with the sudden change that the falling tree had made in their environment, other pileolated warblers soon filled the niche that was left vacant. Each spring, after the tree fell, several pairs of warblers flitted nervously about in search of insects in the willow thickets. As life and luck go, some were successful in raising their broods, others fell to the predators of the forest. But without the jays, the weasels, and the sharp-shinned hawks, the meadow would have been a duller place. Other montane pocket gophers and short-tailed meadow mice took the places of their ancestors that had either been eaten by predators or had died of old age. The pine squirrels conducted regular raids, on others of their kind, across the fallen tree "bridge," and occasionally a coyote or a pine marten came hunting there and brought excitement to the quiet meadow. But after the great tragedies and abrupt changes of that first summer, when the giant fell, life in the meadow became adjusted and formed a kind of balance.

Nothing is quite the same as before, however. In the summer the haunting melodious voice of the Townsend's solitaire occasionally sounds across the meadow, and the grasses, sedges, and shooting stars still bloom. In the winter, with the coming of the deep snows, some of the animals like the deer, move down to the lower, warmer valleys, and the warblers, and the solitaires migrate to warmer climates; others, such as the golden-mantled ground squirrel and the lodgepole chipmunks, prepare to sleep the winter through; still others — the gopher and the provident pine squirrel remain — one the undisputed monarch below the earth, the other the ever-noisy jester above the ground.

As the cold winter moon casts blue shadows on the snow-bound meadow, the horned owl sends a muffled message to its mate in the Jeffrey pine up the ridge. Then it turns its head to watch with its great yellow eyes two meadow mice that are running over the snow, close to the safety of their warm nests beneath the tree that fell in the meadow. The full cycle of seasons, and of life, had turned, as a wheel spins, and as the earth circles in its orbit.

REPORT OF THE 1956 BIO-DYNAMIC FARM CONFERENCE

The purpose of the conference was announced to be that of introducing and demonstrating the practical application of the Biodynamic Method of farming and gardening. The lectures and discussions all contributed to this central theme. The meeting was held at Golden Acres Farm, Newtown, Penna., in September, where Mr. Stuber welcomed the group on Friday evening. Dr. Pfeiffer opened the conference with a down to earth talk on Farm Management, Planning, and Conversion.

The questions most frequently heard from people inquiring about B. D. are: "Does it pay?" and "Is it much work?" The answers he said are that it all depends on whether or not you are a good farmer to begin with. You must start by taking careful inventory to know what you have to work with, how good the soil is, and how much your dairy can produce. One thing is certain, the farm should be self-supporting, and a monoculture cannot be made self-supporting.

In taking inventory the first item is the soil which should be studied by soil analysis, but not merely chemical analysis. For if the soil structure is not good, you will be wasting all your money in every other detail. Once a soil is run down, it costs as much to bring it back as to buy a new farm.

The important question is: "Is the farm producing enough organic matter to build up its soil?" In a 5-year crop rotation ten tons per acre of compost would maintain soil fertility. The amount of NPK in 10 tons is about half the amount advised by some authorities. The rest is produced by the biological processes in the life of the soil itself. On his farm in Chester, N. Y., Dr. Pfeiffer told us, the soil produced 17 T per acre of silage corn, 40 to 52 bushels of oats and 36 to 42 bushels of wheat on a neutral soil with 4-5% organic matter content, soil which has never received a trace of commercial fertilizer.

In addition to soil analysis the farmer should make profiles in every field to study the soil structure. You must find out about the condition of the underlying layers of the soil as well as of the topsoil. The Organic Matter Content decides whether you will have fertility or sterility. If the organic matter content is less than 1.5% it is run down and even with fertilizer you cannot bring it up. 2% organic matter can in time be brought up to a maximum of 4-5%. At present the United States average Organic Matter Content is 1.5%.

There is a parallel in the field of medicine, for the doctors tell us that it takes about as long to get well as it took one to get sick. Professor Kellogg says that once a soil is run down it is impossible to bring it back to fertility. Dr. Pfeiffer stated that it is possible, but once erosion has started the price will be so great that it may cost almost as much as to buy a new farm. Thus one should take all possible steps to prevent the soil from losing its fertility.

He went on to tell how to take inventory of the assets on the farm. One should have a map of the farm. In some counties the Soil Conservation Department has made aerial surveys. By studying these one can learn the state of fertility, low spots, evidences of poor drainage, or erosion. One can thus locate problem fields. Then one can take soil samples to test the best, the poorest, the average, and/or problem fields. The soil tests will reveal OM content and pH. If the pH is below 5.8 clover and alfalfa will not flourish. If the OM content is below 1.5% the soil is exposed to depletion.

Nitrogen indicates the biological activity of the soil. One should try to determine how much N in the soil is converted by bacteriological activity. 24-48 pounds of NO3 is considered to be high in soils with 2% OM. In our biodynamic soils we have frequently found twice that much. Calcium at the rate of 2000

lbs. to the acre is sufficient. If the soil contains a moderate amount of lime and is still acid, the lime has not been assimilated. There may be a drainage problem.

There is a biological relationship between the soil and what grows on it. Soil structure and chemistry change with enzyme and bacterial activities associated with different crops. For instance, with clover the microflora is richer than with corn.

Once a soil is being rebuilt the cultivation will be that much easier and thus cheaper. Compost is a good supplement to manure. In fact, manure should be composted too and not applied raw.

To retain as much manure as possible when pasturing it is recommended that the pastures be subdivided into small lots and to rotate the cattle from lot to lot. One acre, historically, is about the size field which a man can work in one day. With the tractor and other farm machinery one man can care for a larger area. The proper size is important for sound field management. It ought to be possible for all operations to be completed in one day. Very few farmers know anything about field proportions and soil management.

Of recent years many new machines have been developed to help the farmer operate economically and to conserve the soil structure: the various subsoilers, Seaman tiller, Graham plow, etc.

One hour's additional work daily in treating and setting up manure in piles as it comes from the barn can save manpower, horsepower and money.

When a farm is to be reorganized on Biodynamic lines the farmer should first plan to have enough feed for the livestock. He should reduce his labor in working hours to gain time for proper treatment of manure. The treatment of the manure is the most important thing. This may be done by building compost piles and integrating them with the manure piles. This may enable the farmer to maintain production without buying fertilizer or feed, only buying a protein supplement for poultry.

The health of the livestock on the farm must be improved. In ten years of poultry raising in Holland by the B. D. method there was no case of coccidiosis, tumors or cysts. The hogs were healthy. There was no Bang's Disease among the cattle.

To convert a farm to the Biodynamic system we have to think differently; we have to have an understanding of biological factors. In Holland B. D. has been followed since 1928,

almost 30 years. The average yield of wheat for 20 years has been over 65 bushels per acre. Two crops yielded up to 100 bushels of wheat. Last year the yield was 135 bushels of oats per acre.

On Saturday morning Mr. Stuber gave a history of Golden Acres Farm after which Karl Behlke gave a composting demonstration. When fields are composted at the rate of 10 T per acre, the crops may not seem to grow as fast at first but they will continue to grow in case of a drought. Golden Acres produces about 46,000 pounds of milk per month from a herd of 50 registered Guernseys.

The poultry farm supports 3000 laying hens and 1000 pullets. The Orchard Farm is the newest project and when completed will contain 10,000 trees, 90% of which will be apple trees. Mr. Stuber believes that dwarf fruit trees are the trees of the future. He hopes also to have 6-700 grape vines.

Dr. Pfeiffer presented various details in regard to compost making: Compost to be used on corn does not have to be completely rotted, the decomposition can be completed in the ground. Compost for vegetable gardens, pastures, or orchards, should be well rotted. Golden Acres uses a large amount of coffee grounds in order to stretch the manure and garbage and produces a mixed compost. To apply raw coffee grounds directly to the soil causes an increase in acidity. When raw materials such as field trash, waste, or green manure are put in the soil they tie down the soil life during their decomposition period. During that time nutrients are not available to the plants. The nitrogen is tied down for 2 to 3 months, grain grows yellow and potatoes suffer.

On the subject of plowing under fresh manure he stated: Apparently we bring organic matter into the soil, but it is undigested organic matter and it increases the acidity and does not result in a stable, lasting nutriment. The bacterial life in decomposing organic matter is different from that which builds up humus. Manure needs a digesting period in advance before it enters the soil. Thus one can build up the organic matter content of soils.

The question was asked about the manure in the loafing barn, whether it was necessary that it be set up in piles if it were sprayed with bacterial starter right where it is. Dr. Pfeiffer recommended making the pen small enough to put in enough animals to make the manure solid and fairly deep. There should be a slanted floor so that the liquid manure col-

lects at one side or end. Spray bacterial starter every time you have to add new litter. If you have a cement floor, throw some good topsoil on the floor before the manure begins to pile up.

Saturday evening's lecture was given by Dr. W. Coda Martin on the subject *What Medicine and Nutrition Expect from the Farmer*. Dr. Martin said the time to attack and prevent the development of degenerative diseases is before the mother is pregnant. The farmer of today should be responsible to see that the soil is fertile and that both soil and animals are in a good state of health. The food processors should be responsible and see to it that inspection, storage, transportation and distribution retain the health giving properties of foods. The physician is responsible for human nutrition. He should know about the selection of foods and he should study the assimilation of food in the body. There should be a better understanding and better cooperation between man and the soil.

Life must be in the soil in order to produce life in the people who eat the foods. Anabolism is the constructive phase, catabolism is the breaking down process in the digestive system. Every species has a "built in time clock" so that a butterfly lives 24 hours, for instance, an alligator 2 or 3 or 400 years, and man normally about 70 years. In the human body there are regulating forces and anabolism must keep ahead of catabolism. The criterion of youth is the degree of elasticity in the arteries, which can be tested by an oscillometer. In 1900 the life expectancy of Americans was 47 years at a time when infectious diseases were prevalent. In 1950 the life expectancy was calculated to be 67 years.

However, as the infectious diseases decrease, the degenerative diseases are on the increase. Every year the degenerative diseases are appearing earlier in American young people. There is rapid degeneration of the health of the youth of America. At the time of the Korean War 50% of the men registered had physical disabilities and psychoneurotic tendencies, heart disease and early arteriosclerotic symptoms.

One of the causes of this physical degeneration of our youth is malnutrition: the over-consumption of highly refined and over-processed foods. When foods are highly refined, the wheat germ, vitamins and essential nutritional factors are removed and they cannot maintain the structural strength of the body.

Plants and animals raised on poor soil make poor food, and weak human beings. There is a 10% decrease in protein content,

a decline of lysine tryptophane which controls the utilization of all the other amino acids and the whole metabolism. This interferes with the structure of the body and its health.

When grains contain a lower than normal protein this creates a health problem. The weak and unstable protein molecule which is structurally defective is passed on to the human body and causes weaknesses. If the foundation of the organs is not properly formed in prenatal stages, the person will have low vitality, emotional instability, little resistance and no ambition. There are 95 million registered sick people in the United States today. The Life Insurance statistics show 32 million overweight people, overweight caused by refined carbohydrates which are related to degenerative diseases in the tissues. The United States faces a critical state of physical degeneration right now.

The farmer is at the base of the pyramid. It is his duty to build up and protect the soil.

Food must also be free from harmful insecticides. One out of every 12 acres is now being sprayed from the air.

The final criterion for food: Will it maintain healthy human beings free from disease? The new concept for food production: from the soil to the cells of the body. Transportation, processing, and distribution of food should be rethought with this new concept in mind. Degeneration is already proceeding at the rate of 1½ per cent per year. If one vitamin is removed from the diet of experimental animals 70% of their offspring are born with deformities.

On the subject of insecticide sprays, Dr. Martin quoted authorities who say: "The dangers are insignificant." However, many new facts have come to light within the last two months. Michigan State University has experimented with a chlorinated hydrocarbon derivative of DDT. It was sprayed on the chromosomes of seeds and caused unfavorable mutations in the plants. The same thing will happen if it is sprayed on foods, causing mutations in human life.

Lindane will produce changes in chromosomes. Chlordane and DDT derivatives will have the same effect. The International Cancer Society in Rome has made the statement that Parathion and other insecticides are carcinogenic. Fat biopsies in human beings show poisonous residues of DDT above the toxic level of 5 ppm up to 15 ppm. Dr. Martin explained that chlorinated hydrocarbons interfere with oxygen getting to the cells

of the human body. When cellular oxidation is interrupted the cell is turned into a cancer cell. He stated that these sprays are dangerous and that there is nothing insignificant about their use.

By the first months of 1956, fifty per cent of the cattle of the United States will have been fed food containing stilbesterol. The reason is purely economic. The stilbesterol causes retention of water and increase of fat in the carcasses of the animals. Wm. Smith of the Cancer Research Society states that infinitesimal amounts of stilbesterol are already carcinogenic. From short range nutritional studies, Dr. Warburg believes that children now being fed with meat containing stilbesterol will have cancer at 10, 20 or 30 years of age.

Dr. Pfeiffer explained at this point that a large dose of a substance may have little effect on a body as compared with repeated doses of minute quantities.

Stilbesterol becomes concentrated in the liver. Chlorinated hydrocarbons collect in the fat. The lean meat contains 10 ppm whereas the fat contains 60 ppm.

In view of all these problems Dr. Martin went on to state that physicians must insist that foods be composed of healthy plants grown on fertile soil. Today there is no such food available for the general public. The total concept of nutrition from the soil to the cells of the body requires a new orientation in our thinking. This is an educational problem for the farmer, the food processors and the doctors as well as the general public.

On Sunday various brief reports were presented. The Rev. John Philbrick and Mr. Piening told a bit about their farms. Heinz Grotzke next spoke on fruit and vegetable growing. He hopes first to improve the soil as the need is indicated by soil analyses. Then he spoke of the insects which must be kept under control. He hopes to get rid of weeds and wild grasses by cultivation and composting. To improve the soil he plans to use compost and mulch. Next year he intends to grow soybeans and vetch for mulch material. He intends to plow not too deeply, say 4 to 5 inches to increase aeration and encourage the microlife. He is raising boxes of earthworms to feed the hens in place of antibiotics. The earthworm castings will be used for starting cabbage, pepper and tomato plants in the greenhouse. He said, "As far as possible we try to bring life into the soil in order to grow quality produce."

Joe Knoblauch next spoke about the fruit trees. He said, "It is no use to drink biodynamic milk if you have to eat sprayed fruit. Here on this farm our task is to close the biological circle." The fruit trees are being planted in holes dug with a tree hole digger and treated with compost. Each tree is dipped in tree paste before being planted. The trees are sprayed with biodynamic sprays for two purposes; first, the treatment of the trees over a whole year, regardless of the fruit, and secondly the schedule of care for the fruit itself. In the fall each tree gets 25 to 50 pounds of compost. Then the mulch is put on. The mulch prevents the roots from being lifted by frost. Various points concerning sprays and specific remedies and schedules were then discussed. This material can be found in Dr. Pfeiffer's lead article in this issue and in the conclusion of it in the following number. This complete and detailed material concerning the care and treatment of fruit trees, berries and shrubs is to be reprinted in pamphlet form in the near future.

On Sunday afternoon Dr. Pfeiffer spoke on the *Biological Concept As A Matter of Principle*. The question is how to get the soil ready for a garden in one year and the process is the same for a rundown field. Let's plow this field in the fall and settle it over the winter. In spring go over it with the rototiller or Seaman tiller and put in a good amount of compost. Then work it over a period of 4 to 6 weeks, give it dry cultivation. If it is too dry, irrigate. When the structure is right, cultivate again. The weeds will grow. Give it several compost dressings at the rate of 5 to 10 tons to the acre. Give it 3 or 4 cultivations throughout the summer. It should have perfect structure and be ready to plant in the second year. This is better than struggling for 3 or 4 years to get the soil ready for seeding.

Dr. Pfeiffer then spoke of hop culture and how to grow strawberries, giving the biological principles governing their growth.

Mulch does the same thing that snow does: it warms the soil to the same depth as the height of the mulch. If there is a three foot snowfall, the effect of the snow reaches down into the soil to a depth of three feet. A mulch acts in the same way. It holds moisture, makes the structure crumbly and encourages the biological processes as deep in the ground as the thickness of the cover. In a heavy, sticky clay soil build the mulch up to one or two feet and just let it lie there. It should however be

carefully checked. If put on when the soil is too dry it will prevent rain from penetrating. The mice, beetles and insects will hibernate there. Remove the mulch to aerate the soil and replace with new material. If it is perforated by many little holes you may find many borers and beetles are being protected there.

The winter moisture and frost ought to be allowed to penetrate the soil to help the formation of a beneficial structure. The mulch may have to be removed to let air and frost into the soil. When to put the mulch back on will depend on the moisture content of the soil.

These are just a few of the many instances cited by Dr. Pfeiffer illustrating the application of the biological concept in farming and gardening.

Expression should be made of the gratitude and appreciation of everyone who attended the Farm Conference for the warm welcome given us by the Stubers and all their helpers. At the same time we want to express our warmest gratitude for the generous hospitality shown us by the Fetzers who provided rooms and meals for so many of us. We especially enjoyed seeing their beautiful vegetable garden and later eating some of the produce. As is always the case, one of the most valuable aspects of the whole weekend was the opportunity to meet and talk informally with people who could explain their own enthusiasms, as Mr. Fetzer did on Sunday afternoon when we visited his barn and admired his cows.

HELEN PHILBRICK

COMPOSTING COMES OF AGE

A BOOK REVIEW

In "The Compost Manufacturers Manual", a new volume just published, Dr. Ehrenfried E. Pfeiffer puts large scale composting into its proper place in modern man's environment. He details processes of practical efficiency and economy, essential in a time of high labor costs. He shows clearly how the controlled manufacture of compost (in contrast to older, haphazard ways,) can produce a high-standard product which, one might add, will become increasingly necessary to help in the feeding of the world's still growing population.

The book is published and copyrighted by The Pfeiffer Foundation, Inc., of Philadelphia, Pa., a non-profit organization "intended to foster and promote scientific and cultural, humani-

tarian work". Consisting of 137 pages, it is obtainable through the Biochemical Research Laboratory, Threefold Farm, Spring Valley, N. Y., at $5.00 a copy. All proceeds from the sale of the book go to The Pfeiffer Foundation, Inc.

Being first and foremost a working manual, this book obviously does not have the "reader appeal" for the layman, of some of Dr. Pfeiffer's earlier works such as his "The Earth's Face and Human Destiny" — an unrivalled treatment of the problems of ecology. But it can be emphatically recommended to *anyone* who is, for instance, faced with a problem of municipal refuse disposal in his or her locality. For one thing, a plant set up in accordance with the Pfeiffer Method costs far less than an incinerator to handle the same volume of material. The operation will at least meet its costs, through the sale of the finished product. Finally, there is the larger consideration that instead of being a total waste to society, refuse disposal becomes an aid to food production.

In his preface Dr. Pfeiffer points out that this Manual (based on 30 years of practical experience in both small and large scale composting) is meant to be a guide for large scale compost manufacturing of city and industrial wastes. Of himself and his associates, he points out that:

"Our only interest in this matter is to promote progress in farming and gardening, to improve soils for the production of healthy crops and livestock, and to aid in overcoming the greatest deficiency disease from which our soils at present suffer, the lack of stable humus. For this reason we emphasize production of a humus-compost rather than merely the breaking down of wastes. A quality product of highest value is the aim."

The opening chapter presents "A General Review of the Problems of Composting". In the course of it the author notes that the past history of efforts toward industrial composting has led many to the objection that the whole idea is "too expensive". He adds that "Many a process which looks good when 5 or 10 tons per day are produced becomes too troublesome and expensive when 50 to 100 tons per day have to be treated". He goes on to show, in exhaustive detail, how the methods he has developed, and has *applied* in large-scale use, meet and answer the legitimate objections of those who may have had, or heard of, bad experiences in the past.

The volume is a treasure-trove of practical experience, now made available to all, and is sure to have an ever-increasing impact on our times.

FRED HECKEL

THE RELATIONSHIP OF NUTRITION AND THE PSYCHOLOGICAL DEVELOPMENT OF THE CHILD

Dr. George Watson of the School of Philosophy of the University of Southern California reports that there is a growing amount of clinical evidence that indicates that some of the psychoneuroses and functional psychoses are, in part, biochemical disorders of the body and not illness of the mind as such. He showed that experimental psychoneurosis can be produced in mentally normal people entirely by nutritional deficiencies and brought back into psychological adjustment with good nutrition and without the aid of psychotherapy.

A more specific study showed that a deficiency of Thiamine (B_1) alone will result in psychiatric symptoms such as nervousness, irritability, depression and, in some cases, hysteria. It is well known to biochemists that a deficiency of Thiamine and other B complex vitamins in the diet will cause incomplete carbohydrate metabolism, which results in substances known as toxic metabolites. These metabolites, Pyruvic acid being the most common one, accumulate in the nerves and brain and thus interfere with their normal function.

Another factor that has been given the proper attention is the relationship of medical illness and mental disorders. One hospital reported that physical illness played some part in the mental illness in about 20% of the admissions and that it is a definite factor in about 3%. Most of the patients showed improvement of their mental status with improvement of their diets and physical illness, especially secondary anemia.

Another study at the University of Southern California revealed that of 32 emotionally disturbed patients given vitamins and minerals as a dietary supplement, without any change in their diets, 13 showed marked improvement and 15 moderate improvement of their mental states.

Louis E. Powell (Child Development—9—1938) investigated the effects of nutritional improvement on the intelligence quotients of 41 children with a history of poor nutrition and found a definite relationship between the nutritional status of the children and their I.Qs. The work further showed that the younger the good nutrition was started, the greater was the chance of improving the child's I.Q. This study specifically indicates the value of a planned nutritional program for the pre-school child, from 2-4 years of age.

A report from London in May, 1956, showed that when 17 mal-adjusted and delinquent girls between the ages of 11 and 15 years, were given a nourishing diet of protective foods they rapidly became less aggressive, less quarrelsome and many bad habits subsided. It was the opinion of the author that the part the diet played in their personality change was undeniable.

The most outstanding study on the long range value of good nutrition in health and mental status of children was that made by the Pennsylvania State College. In one community where the children were kept under observation for more than 8 years and where the nutritional status was extremely low, 40% of the boys tested, on reaching military age, were rejected for physical and mental disorders. A control group of children who had good diets from childhood, remained physically and mentally healthy through early adulthood.

The results of these studies by various research groups in nutrition are applicable to the treatment of retarded children. This has been confirmed by many years of observation and treatment of retarded children at the Camp Hill School in Aberdeen, Scotland.

Good quality food depends on the soil from which it comes. For the best results of a nutritional program, the food should be of high quality, grown on fertile soil and free of toxic insecticide residue.

W. CODA MARTIN, M. D.

ADVERTISEMENT

WANTED FOR RESALE

Biodynamically grown grains for human consumption, fruit, nuts, honey, potatoes, carrots, cheese, butter (unpasteurized), sun-dried fruits, alfalfa seeds, etc.

A. F. A. KONIG • Rt. 4, Box 144-A

Hendersonville, N. C.